

&lt;110&gt; KAO CORPORATION

&lt;120&gt; Recombinant microorganisms

&lt;130&gt; KS0796

&lt;150&gt; JP 2003-379114

&lt;151&gt; 2003. 11. 7

&lt;160&gt; 22

&lt;170&gt; PatentIn Ver. 3.1

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gtt ttt gaa gac ggt aca cgt caa ggt tgg gac tgg gct gga gag tct  
 Val Phe Glu Asp Gly Thr Arg Gln Gly Trp Asp Trp Ala Gly Glu Ser  
 565 570 575

ggt gtg aaa aca gct tta aca att gaa gaa gca aac ggt tct aac gcg  
 Gly Val Lys Thr Ala Leu Thr Ile Glu Glu Ala Asn Gly Ser Asn Ala  
 580 585 590

tta tca tgg gaa ttt gga tac cca gaa gta aaa cct agt gat aac tgg  
 Leu Ser Trp Glu Phe Gly Tyr Pro Glu Val Lys Pro Ser Asp Asn Trp  
 595 600 605

gca aca gct cca cgt tta gat ttc tgg aaa tct gac ttg gtt cgc ggt  
 Ala Thr Ala Pro Arg Leu Asp Phe Trp Lys Ser Asp Leu Val Arg Gly  
 610 615 620 625

gaa aat gat tat gta act ttt gat ttc tat cta gat cca gtt cgt gca  
 Glu Asn Asp Tyr Val Thr Phe Asp Phe Tyr Leu Asp Pro Val Arg Ala  
 630 635 640

aca gaa ggc gca atg aat atc aat tta gta ttc cag cca cct act aac  
 Thr Glu Gly Ala Met Asn Ile Asn Leu Val Phe Gln Pro Pro Thr Asn  
 645 650 655

ggg tat tgg gta caa gca cca aaa acg tat acg att aac ttt gat gaa  
 Gly Tyr Trp Val Gln Ala Pro Lys Thr Tyr Thr Ile Asn Phe Asp Glu  
 660 665 670

tta gag gaa gcg aat caa gta aat ggt tta tat cac tat gaa gtg aaa  
 Leu Glu Glu Ala Asn Gln Val Asn Gly Leu Tyr His Tyr Glu Val Lys  
 675 680 685

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 Ile Asn Val Arg Asp Ile Thr Asn Ile Gln Asp Asp Thr Leu Leu Arg  
 690 695 700 705

aac atg atg atc att ttt gca gat gta gaa agt gac ttt gca ggg aga  
 Asn Met Met Ile Ile Phe Ala Asp Val Glu Ser Asp Phe Ala Gly Arg  
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 Val Phe Val Asp Asn Val Arg Phe Glu Gly Ala Ala Thr Thr Glu Pro  
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 740 745 750

gag aag gaa gcg aaa aaa gaa caa aaa gaa gca gag aaa gaa gag aaa  
 Glu Lys Glu Ala Lys Lys Glu Gln Lys Glu Ala Glu Lys Glu Glu Lys  
 755 760 765

gaa gca gta aaa gaa gaa aag aaa gaa gct aaa gaa gaa aag aaa gca  
 Glu Ala Val Lys Glu Glu Lys Lys Glu Ala Lys Glu Glu Lys Lys Ala  
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atc aaa aat gag gct acg aaa aaa taatctaata aactagttat agggttatct

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3003

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attaaagaaa gcaagggtgtt tatacgatat taaaaaggta gcgatittaa attgaaacct 3225  
ttaataatgt ctltgatag aatgatgaag taatttaaga gggggaaacg aagtgaaaac 3285  
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Lys Arg Pro Ser Glu Ala Gly Ala Leu Gln Leu Gln Glu Val Asp Gly  
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Gln Met Thr Leu Val Asp Gln His Gly Glu Lys Ile Gln Leu Arg Gly  
40 45 50

Met Ser Thr His Gly Leu Gln Trp Phe Pro Glu Ile Leu Asn Asp Asn  
55 60 65

Ala Tyr Lys Ala Leu Ala Asn Asp Trp Glu Ser Asn Met Ile Arg Leu  
70 75 80

Ala Met Tyr Val Gly Glu Asn Gly Tyr Ala Ser Asn Pro Glu Leu Ile  
85 90 95

Lys Ser Arg Val Ile Lys Gly Ile Asp Leu Ala Ile Glu Asn Asp Met  
100 105 110 115

Tyr Val Ile Val Asp Trp His Val His Ala Pro Gly Asp Pro Arg Asp  
120 125 130

Pro Val Tyr Ala Gly Ala Glu Asp Phe Phe Arg Asp Ile Ala Ala Leu  
135 140 145

Tyr Pro Asn Asn Pro His Ile Ile Tyr Glu Leu Ala Asn Glu Pro Ser  
150 155 160

Ser Asn Asn Asn Gly Gly Ala Gly Ile Pro Asn Asn Glu Glu Gly Trp  
165 170 175

Asn Ala Val Lys Glu Tyr Ala Asp Pro Ile Val Glu Met Leu Arg Asp  
180 185 190 195

Ser Gly Asn Ala Asp Asp Asn Ile Ile Ile Val Gly Ser Pro Asn Trp  
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 Ser Gln Arg Pro Asp Leu Ala Ala Asp Asn Pro Ile Asp Asp His His  
 215 220 225  
 Thr Met Tyr Thr Val His Phe Tyr Thr Gly Ser His Ala Ala Ser Thr  
 230 235 240  
 Glu Ser Tyr Pro Pro Glu Thr Pro Asn Ser Glu Arg Gly Asn Val Met  
 245 250 255  
 Ser Asn Thr Arg Tyr Ala Leu Glu Asn Gly Val Ala Val Phe Ala Thr  
 260 265 270 275  
 Glu Trp Gly Thr Ser Gln Ala Asn Gly Asp Gly Gly Pro Tyr Phe Asp  
 280 285 290  
 Glu Ala Asp Val Trp Ile Glu Phe Leu Asn Glu Asn Asn Ile Ser Trp  
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 Ala Asn Trp Ser Leu Thr Asn Lys Asn Glu Val Ser Gly Ala Phe Thr  
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 Pro Phe Glu Leu Gly Lys Ser Asn Ala Thr Ser Leu Asp Pro Gly Pro  
 325 330 335  
 Asp Gln Val Trp Val Pro Glu Glu Leu Ser Leu Ser Gly Glu Tyr Val  
 340 345 350 355  
 Arg Ala Arg Ile Lys Gly Val Asn Tyr Glu Pro Ile Asp Arg Thr Lys  
 360 365 370  
 Tyr Thr Lys Val Leu Trp Asp Phe Asn Asp Gly Thr Lys Gln Gly Phe  
 375 380 385  
 Gly Val Asn Gly Asp Ser Pro Val Glu Asp Val Val Ile Glu Asn Glu  
 390 395 400  
 Ala Gly Ala Leu Lys Leu Ser Gly Leu Asp Ala Ser Asn Asp Val Ser  
 405 410 415  
 Glu Gly Asn Tyr Trp Ala Asn Ala Arg Leu Ser Ala Asp Gly Trp Gly  
 420 425 430 435  
 Lys Ser Val Asp Ile Leu Gly Ala Glu Lys Leu Thr Met Asp Val Ile  
 440 445 450  
 Val Asp Glu Pro Thr Thr Val Ser Ile Ala Ala Ile Pro Gln Gly Pro  
 455 460 465  
 Ser Ala Asn Trp Val Asn Pro Asn Arg Ala Ile Lys Val Glu Pro Thr  
 470 475 480

Asn Phe Val Pro Leu Gly Asp Lys Phe Lys Ala Glu Leu Thr Ile Thr  
 485 490 495

Ser Ala Asp Ser Pro Ser Leu Glu Ala Ile Ala Met His Ala Glu Asn  
 500 505 510 515

Asn Asn Ile Asn Asn Ile Ile Leu Phe Val Gly Thr Glu Gly Ala Asp  
 520 525 530

Val Ile Tyr Leu Asp Asn Ile Lys Val Ile Gly Thr Glu Val Glu Ile  
 535 540 545

Pro Val Val His Asp Pro Lys Gly Glu Ala Val Leu Pro Ser Val Phe  
 550 555 560

Glu Asp Gly Thr Arg Gln Gly Trp Asp Trp Ala Gly Glu Ser Gly Val  
 565 570 575

Lys Thr Ala Leu Thr Ile Glu Glu Ala Asn Gly Ser Asn Ala Leu Ser  
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Trp Glu Phe Gly Tyr Pro Glu Val Lys Pro Ser Asp Asn Trp Ala Thr  
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Ala Pro Arg Leu Asp Phe Trp Lys Ser Asp Leu Val Arg Gly Glu Asn  
 615 620 625

Asp Tyr Val Thr Phe Asp Phe Tyr Leu Asp Pro Val Arg Ala Thr Glu  
 630 635 640

Gly Ala Met Asn Ile Asn Leu Val Phe Gln Pro Pro Thr Asn Gly Tyr  
 645 650 655

Trp Val Gln Ala Pro Lys Thr Tyr Thr Ile Asn Phe Asp Glu Leu Glu  
 660 665 670 675

Glu Ala Asn Gln Val Asn Gly Leu Tyr His Tyr Glu Val Lys Ile Asn  
 680 685 690

Val Arg Asp Ile Thr Asn Ile Gln Asp Asp Thr Leu Leu Arg Asn Met  
 695 700 705

Met Ile Ile Phe Ala Asp Val Glu Ser Asp Phe Ala Gly Arg Val Phe  
 710 715 720

Val Asp Asn Val Arg Phe Glu Gly Ala Ala Thr Thr Glu Pro Val Glu  
 725 730 735

Pro Glu Pro Val Asp Pro Gly Glu Glu Thr Pro Pro Val Asp Glu Lys  
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Asn Glu Ala Thr Lys Lys  
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PCT/JP2004/016890

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aactaaagat tgaatatagaa gtagaagaca acggacataa gaaaattgta ttagttttaa 180  
ttatagaaaa cgcttttcta taattattta tacctagaac gaaaatactg tttcgaaagc 240  
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tagtaticta atttcaacat gctataataa atttgtaaga cgcaatatac atcttttttt 360  
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agtcaagtag tcataattta gataacttat aagtgtgtga gaagcaggag agaattctggg 480  
ttactcaciaa gttttttaaa acattatcga aagcactttc ggttatgctt atgaatttag 540  
ctatttgatt caattacttt aataatttta ggaggtaat atg atg tta aga aag 594  
Met Met Leu Arg Lys  
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Lys Thr Lys Gln Leu Gly Arg Pro Ala Gln Ala Asp Gly Leu Asn Gly  
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Thr Met Met Gln Tyr Tyr Glu Trp His Leu Glu Asn Asp Gly Gln His  
10 15 20  
tgg aat cgg ttg cac gat gat gcc gca gct ttg agt gat gct ggt att 738  
Trp Asn Arg Leu His Asp Asp Ala Ala Ala Leu Ser Asp Ala Gly Ile  
25 30 35  
aca gct att tgg att ccg cca gcc tac aaa ggt aat agt cag gcg gat 786  
Thr Ala Ile Trp Ile Pro Pro Ala Tyr Lys Gly Asn Ser Gln Ala Asp  
40 45 50  
gtt ggg tac ggt gca tac gat ctt tat gat tta gga gag ttc aat caa 834  
Val Gly Tyr Gly Ala Tyr Asp Leu Tyr Asp Leu Gly Glu Phe Asn Gln  
55 60 65  
aag ggt act gtt cga acg aaa tac gga act aag gca cag ctt gaa cga 882  
Lys Gly Thr Val Arg Thr Lys Tyr Gly Thr Lys Ala Gln Leu Glu Arg  
70 75 80 85



WO 2005/045045  
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Ala Ile Gly Ser Leu Lys Ser Asn Asp Ile Asn Val Tyr Gly Asp Val  
90 95 100

gtg atg aat cat aaa atg gga gct gat ttt acg gag gca gtg caa gct 978  
Val Met Asn His Lys Met Gly Ala Asp Phe Thr Glu Ala Val Gln Ala  
105 110 115

gtt caa gta aat cca acg aat cgt tgg cag gat att tca ggt gcc tac 1026  
Val Gln Val Asn Pro Thr Asn Arg Trp Gln Asp Ile Ser Gly Ala Tyr  
120 125 130

acg att gat gcg tgg acg ggt ttc gac ttt tca ggg cgt aac aac gcc 1074  
Thr Ile Asp Ala Trp Thr Gly Phe Asp Phe Ser Gly Arg Asn Asn Ala  
135 140 145

tat tca gat ttt aag tgg aga tgg ttc cat ttt aat ggt gtt gac tgg 1122  
Tyr Ser Asp Phe Lys Trp Arg Trp Phe His Phe Asn Gly Val Asp Trp  
150 155 160 165

gat cag cgc tat caa gaa aat cat att ttc cgc ttt gca aat acg aac 1170  
Asp Gln Arg Tyr Gln Glu Asn His Ile Phe Arg Phe Ala Asn Thr Asn  
170 175 180

tgg aac tgg cga gtg gat gaa gag aac ggt aat tat gat tac ctg tta 1218  
Trp Asn Trp Arg Val Asp Glu Glu Asn Gly Asn Tyr Asp Tyr Leu Leu  
185 190 195

gga tcg aat atc gac ttt agt cat cca gaa gta caa gat gag ttg aag 1266  
Gly Ser Asn Ile Asp Phe Ser His Pro Glu Val Gln Asp Glu Leu Lys  
200 205 210

gat tgg ggt agc tgg ttt acc gat gag tta gat ttg gat ggt tat cgt 1314  
Asp Trp Gly Ser Trp Phe Thr Asp Glu Leu Asp Leu Asp Gly Tyr Arg  
215 220 225

tta gat gct att aaa cat att cca ttc tgg tat aca tct gat tgg gtt 1362  
Leu Asp Ala Ile Lys His Ile Pro Phe Trp Tyr Thr Ser Asp Trp Val  
230 235 240 245

cgg cat cag cgc aac gaa gca gat caa gat tta ttt gtc gta ggg gaa 1410  
Arg His Gln Arg Asn Glu Ala Asp Gln Asp Leu Phe Val Val Gly Glu  
250 255 260

tat tgg aag gat gac gta ggt gct ctc gaa ttt tat tta gat gaa atg 1458  
Tyr Trp Lys Asp Asp Val Gly Ala Leu Glu Phe Tyr Leu Asp Glu Met  
265 270 275

aat tgg gag atg tct cta ttc gat gtt cca ctt aat tat aat ttt tac 1506  
Asn Trp Glu Met Ser Leu Phe Asp Val Pro Leu Asn Tyr Asn Phe Tyr  
280 285 290

cgg gct tca caa caa ggt gga agc tat gat atg cgt aat att tta cga 1554  
Arg Ala Ser Gln Gln Gly Gly Ser Tyr Asp Met Arg Asn Ile Leu Arg  
295 300 305

gga tct tta gta gaa gcg cat ccg atg cat gca gtt acg ttt gtt gat 1602  
Gly Ser Leu Val Glu Ala His Pro Met His Ala Val Thr Phe Val Asp  
310 315 320 325

aat cat gat act cag cca ggg gag tca tta gag tca tgg gtt gct gat 1650  
Asn His Asp Thr Gln Pro Gly Glu Ser Leu Glu Ser Trp Val Ala Asp  
330 335 340

tgg ttt aag cca ctt gct tat gcg aca att ttg acg cgt gaa ggt ggt 1698  
Trp Phe Lys Pro Leu Ala Tyr Ala Thr Ile Leu Thr Arg Glu Gly Gly  
345 350 355

tat cca aat gta ttt tac ggt gat tac tat ggg att cct aac gat aac 1746  
Tyr Pro Asn Val Phe Tyr Gly Asp Tyr Tyr Gly Ile Pro Asn Asp Asn  
360 365 370

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Ile Ser Met Ile Asp Glu Leu Leu Asp Ala Arg Gln  
375 380 385

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390 395 400 405

gta gga tgg act agg gaa gga tct tcc tcc aga cct aat tca ggc ctt 1890  
Val Gly Trp Thr Arg Glu Gly Ser Ser Ser Arg Pro Asn Ser Gly Leu  
410 415 420

gcg act att atg tcg aat gga cct ggt ggt tcc aag tgg atg tat gta 1938  
Ala Thr Ile Met Ser Asn Gly Pro Gly Gly Ser Lys Trp Met Tyr Val  
425 430 435

gga cgt cag aat gca gga caa aca tgg aca gat tta act ggt aat aac 1986  
Gly Arg Gln Asn Ala Gly Gln Thr Trp Thr Asp Leu Thr Gly Asn Asn  
440 445 450

gga gcg tcc gtt aca att aat ggc gat gga tgg ggc gaa ttc ttt acg 2034  
Gly Ala Ser Val Thr Ile Asn Gly Asp Gly Trp Gly Glu Phe Phe Thr  
455 460 465

aat gga gga tct gta tcc gtg tac gtg aac caa taacaaaaag ccttgagaag 2087  
Asn Gly Gly Ser Val Ser Val Tyr Val Asn Gln  
470 475 480

ggattccicc ctaactcaag gctttcttta tgcgcttag ctttacgctt ctacgacttt 2147

gaagcttggg gatccgtcga gacaaggtaa aggataaaac agcacaattc caagaaaaac 2207

acgatttaga acctaaaaag aacgaatttg aactaactca taaccgagag gtaaaaaaag 2267

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Asn Asp Gly Gln His Trp Asn Arg Leu His Asp Asp Ala Ala Ala Leu  
20 25 30

Ser Asp Ala Gly Ile Thr Ala Ile Trp Ile Pro Pro Ala Tyr Lys Gly  
35 40 45

Asn Ser Gln Ala Asp Val Gly Tyr Gly Ala Tyr Asp Leu Tyr Asp Leu  
50 55 60

Gly Glu Phe Asn Gln Lys Gly Thr Val Arg Thr Lys Tyr Gly Thr Lys  
65 70 75 80

Ala Gln Leu Glu Arg Ala Ile Gly Ser Leu Lys Ser Asn Asp Ile Asn  
85 90 95

Val Tyr Gly Asp Thr Val Met Asn His Lys Met Gly Ala Asp Phe Thr  
100 105 110

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Glu Ala Val Gln Ala Val Gln Val Asn Pro Thr Asn Arg Trp Gln Asp  
115 120 125

Ile Ser Gly Ala Tyr Thr Ile Asp Ala Trp Thr Gly Phe Asp Phe Ser  
130 135 140

Gly Arg Asn Asn Ala Tyr Ser Asp Phe Lys Trp Arg Trp Phe His Phe  
145 150 155 160

Asn Gly Val Asp Trp Asp Gln Arg Tyr Gln Glu Asn His Ile Phe Arg  
165 170 175

Phe Ala Asn Thr Asn Trp Asn Trp Arg Val Asp Glu Glu Asn Gly Asn  
180 185 190

Tyr Asp Tyr Leu Leu Gly Ser Asn Ile Asp Phe Ser His Pro Glu Val  
195 200 205

Gln Asp Glu Leu Lys Asp Trp Gly Ser Trp Phe Thr Asp Glu Leu Asp  
210 215 220

Leu Asp Gly Tyr Arg Leu Asp Ala Ile Lys His Ile Pro Phe Trp Tyr  
225 230 235 240

Thr Ser Asp Trp Val Arg His Gln Arg Asn Glu Ala Asp Gln Asp Leu  
245 250 255

Phe Val Val Gly Glu Tyr Trp Lys Asp Asp Val Gly Ala Leu Glu Phe  
260 265 270

Tyr Leu Asp Glu Met Asn Trp Glu Met Ser Leu Phe Asp Val Pro Leu  
275 280 285

Asn Tyr Asn Phe Tyr Arg Ala Ser Gln Gln Gly Gly Ser Tyr Asp Met  
290 295 300

Arg Asn Ile Leu Arg Gly Ser Leu Val Glu Ala His Pro Met His Ala  
305 310 315 320

Val Thr Phe Val Asp Asn His Asp Thr Gln Pro Gly Glu Ser Leu Glu  
325 330 335

Ser Trp Val Ala Asp Trp Phe Lys Pro Leu Ala Tyr Ala Thr Ile Leu  
340 345 350

Thr Arg Glu Gly Gly Tyr Pro Asn Val Phe Tyr Gly Asp Tyr Tyr Gly  
355 360 365

Ile Pro Asn Asp Asn Ile Ser Ala Lys Lys Asp Met Ile Asp Glu Leu  
370 375 380

Leu Asp Ala Arg Gln Asn Tyr Ala Tyr Gly Thr Gln His Asp Tyr Phe

Asp His Trp Asp Val Val Gly Trp Thr Arg Glu Gly Ser Ser Ser Arg  
405 410 415

Pro Asn Ser Gly Leu Ala Thr Ile Met Ser Asn Gly Pro Gly Gly Ser  
420 425 430

Lys Trp Met Tyr Val Gly Arg Gln Asn Ala Gly Gln Thr Trp Thr Asp  
435 440 445

Leu Thr Gly Asn Asn Gly Ala Ser Val Thr Ile Asn Gly Asp Gly Trp  
450 455 460

Gly Glu Phe Phe Thr Asn Gly Gly Ser Val Ser Val Tyr Val Asn Gln  
465 470 475 480